## PERSONNEL

Center personnel have backgrounds in Anthropology, Biomechanics, Biomedical Engineering, Ergonomics, Exercise Science, and Kinesiology. The research team is widely published and active in both the scientific and DoD communities.

ADDITIONAL CAPABILITIES

- Cognitive Science
- Engineering Anthropometry
- Epidemiology
- Exercise Physiology
- Human Factors
- Personal Protective Equipment Design
- Preventive and Occupational Medicine
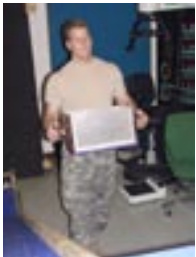
PARTNERS AND COLLABORATORS

- Army Research Office
- Combined Arms Support Command
- Defense Advanced Research Projects Agency
- Massachusetts Institute of Technology
- Marine Corps Warfighting Laboratory
- University of Connecticut
- University of Iowa
- University of Kansas
- University of Massachusetts
- University of Rhode Island
- Walter Reed Army Medical Center

CENTER FOR MILITARY BIOMECHANICS RESEARCH

Natick Soldier Research, Development and Engineering Center (NSRDEC)

U.S. Army Research Institute of Environmental Medicine (USARIEM)

U. S. Army Natick Soldier Systems Center (NSSC)

NSRDEC
Warfighter Science, Technology And Applied Research (WarSTAR) Liaison
COMM: 508-233-4577, DSN: 256-4577
EMAIL: nati-amsrd-nsc-ss@conus.army.mil

USARIEM
Military Performance Division
COMM: (508) 233-4800, DSN: 256-4800
EMAIL: edward.zambraski@us.army.mil

NSSC
Kansas Street
Natick, MA 01760-5000
COMM: (508) 233-4300,
nati-imne-ssc-pa@conus.army.mil

FOCUS

The Center for Military Biomechanics Research conducts basic and applied research in biomechanics, studying body movements, as well as the forces in and on the human body. Research is focused on mechanisms of overuse injury and enhancement of performance. Results are applied to designing Warfighter clothing and equipment, specifying the physical requirements of military occupational tasks, and developing methods to optimize military physical training programs.

LABORATORY FACILITIES

The Center's physical facility consists of a 7,500 square foot dedicated laboratory outfitted with state-of-the-art equipment for 3-dimensional analysis of movement, measurement of external forces on the body, monitoring of muscle activity, determining oxygen consumption, and real-time mapping of pressure patterns. Equipment includes:

- Motion Capture Systems (Qualisys, Peak Motus, Dartfish)
- Force Platforms (AMTI)
- Force Plate Treadmill (AMTI)
- Surface Electromyography (EMG) Systems (Delsys)
- Moment of Inertia Instrument (Space Electronics Inc. XR 250)
- Custom-Built Balance Perturbation System
- Stationary and Portable Metabolic Test Equipment (ParvoMedics TrueMax 2400, COSMED K4B2 Cardio-Pulmonary Exercise Test Equipment)
- Data Acquisition and Analysis Workstations (Qualisys Track Manager, C-Motion Visual3D Professional, LabVIEW, MATLAB)
- Custom-Designed Indoor and Outdoor Obstacle Courses
- Custom-Built Repetitive Box Lift Station
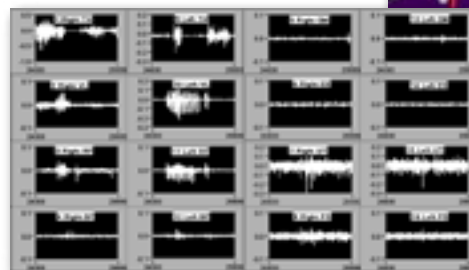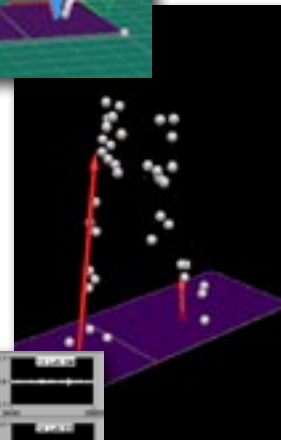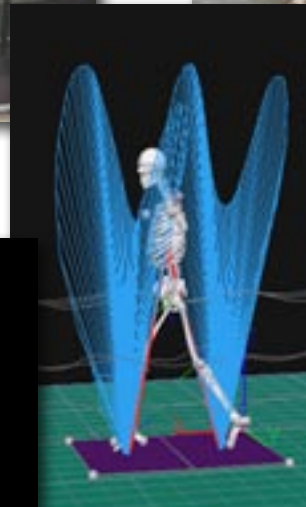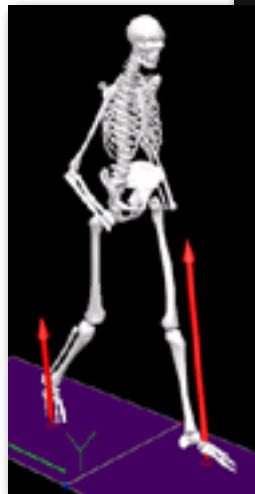
RESEARCH AREAS

- Development of physics-based, dynamic human modeling and simulation tools to optimize design of body armor
- Physiological and biomechanical evaluations of personal protective equipment (e.g., chemical protective systems, body armor)
- Quantification of inertial effects of backpack loads on Warfighter performance
- Modeling of injury potential of head-borne mass during dismounted operations
- Exoskeletal applications to augment Warfighter physical capacities
- Assessment of the biomechanical capability of active duty below-knee amputees to meet military physical performance requirements
- Identification of biomechanical markers associated with physical fatigue
- Development of a dynamical systems model to predict onset of physical fatigue
- Analysis of biomechanical risk factors contributing to lower extremity overuse injuries
- Validation of portable oxygen consumption measurement system for quantification of energy usage during prolonged foot marches carrying heavy loads
- Development of geometric algorithms software to optimize packing of Warfighter's loads